BLM LIBRARY
88005933

Review of Literature and Museums for Groups of the Bombyliidae, Bee Flies, and Outline of the Distributions of Rare and Potentially Endangered Species in the California Desert Conservation Area

By Jack C. Hall

QL
537
.B65
H17

Bureau of Land Management
Library
Bldg. 50, Denver Federal Center
Denver, CO 80225

May 24, 1979

To: Dr. K.H. Berry, COAR
California Desert Program
Bureau of Land Management
3610 Central, Suite 402
Riverside, CA 92506

From: Jack C. Hall
Dept. of Entomology
University of California
Riverside, CA 92502

Subject: Contract. CA-060-8-66

---

1. Report on review of literature and museums for groups of the Bombyliidae $1,000

Jack C. Hall

Jack C. Hall

ID 88005933

The family Bombyliidae contains mostly bright colored flies of various hues and shades. Worldwide there are upwards to 6,000 species distributed on every continental land mass except the areas of the north and south poles. The most northern known bee fly is found in Lapland and the southernmost is found on the island of Tierra del Fuego at the tip of South America (Hall, 1976). Within the Nearctic approximately 1,200 species are known. The majority of the species are found in the arid southwestern United States and northern Mexico. It is estimated that more than 80% of the bombyliid fauna of the Nearctic is found within this area.

As far as is known larvae of all of the species are entomophagous in habit. The one exception is the myrmecophilus Glabellula arctica (Zetterstedt) which is found as an inquiline in the nests of Formica sp. The host preferences of bombyliid species are varied but individual species may be specific in their host selection. For example, Paravilla flavipilosa (Cole) is almost always associated with Diadasia sp., while other members of Paravilla have been found parasitizing a number of ground nesting bees other than Diadasia. Some species act as primary parasites and others are hyperparasitic through various Hymenoptera and Diptera. The family as a whole is considered to be beneficial in habit since most of the species are primary parasites. Other than the Hymenoptera, Lepidoptera, Coleoptera and Orthoptera also serve as hosts for the immature stages. In the case of the latter host there are a number of species that feed exclusively on grasshopper egg pods and as a consequence play a major role in the reduction of local populations of grasshoppers.

Adult bee flies are either monlectic or oligolectic in habit, feeding on both pollen and nectar. As a consequence of their flower visiting habits they are to be considered as important pollinators of native vegetation. The long tongued species feed primarily at flowers with a deep corolla such as Gila while the short tongued species visit those flowers with the shorter corollas, such as the Compositae.

The majority of the species are univoltine with the adults emerging during the warm summer months. Other species exhibit bivoltinism with adults emerging in the spring of the year, laying eggs and the second generation emerging in the fall. The number of generations per year is closely related to the habits of the respective hosts. Some species of Poecilanthrax are univoltine in the "wild" but when attacking cutworms associated with cultivated alfalfa or other crops they exhibit bivoltinism because of the availability of the host caterpillar over a longer period of time.

All of the species studied are distributed over a large area of the southwest. Within the study area of this report the same species has been found from Inyo County to Imperial County. Although some species appear to be rare or not widely distributed they are often locally abundant. Individual desert canyons, like Red Rock Canyon or Berdoo Canyon, may differ from each other in their species makeups at any one time of the year but only rarely have any species been found to be unique to a particular canyon.

The bee flies, as a family, are very poorly known taxonomically. The fauna in the deserts while far from pauperate is not only poorly known but is poorly collected. There are many undescribed forms awaiting description and there are many areas that have not been sampled,

as can be seen on the accompanying maps. Because of the paucity of information concerning the species found in the deserts, we can only generalize for the most part. The distributions given on the accompanying forms exhibit more the favored or easily accessible collecting areas rather than a true picture of specific distribution patterns. In addition many, if not most, of the species dealt with here are distributed in areas outside of the study area. It is for these reasons that it was felt that mapping the distributions of the species contained herein would be totally misleading. None of the species, as far as known, contained herein are unique for the area understudy.

At any single locality a population of bee flies may be considered to be endangered, but throughout the desert areas they may not appear to be so because of their apparent wide distribution. The species are totally dependent upon the presence of their hosts and flowering plants and anything that interferes with these two facets of their biology directly effects the survival of the population. An example of this upset may be found in the Algadones dunes near Glamis in Imperial County where use of recreational vehicles has become unbearable. The plant life, especially annuals, has been destroyed leaving nothing for the flies to feed on. As a consequence populations no longer exist in specific areas where they once abounded. In adjacent areas, where recreational vehicles are not allowed the populations of bee flies have remained fairly constant. Individual species therefore may not be considered endangered when one considers their entire range of distribution. Unfortunately not enough is known at this time to enable me to elaborate more fully.

Museums visited and collections studied.

University of California at Riverside, Berkeley and Davis; University of Arizona; Southern California Academy of Sciences; California Academy of Sciences; California Department of Agriculture; San Diego Natural History Museum; U. S. National Museum (part) and the private collection of N. Evenhuis.

Annotated Bibliography of Literature Pertaining to the California Desert Conservation Area *

Aldrich, J. M. 1905. A Catalogue of North American Diptera. Smithsn. Inst. Smithsn. Misc. Collect. 46(2): 1-680. Lists 41 genera, 453 species with synonyms and distribution by states.

Allred, D. M., Johnson, D. E. and Beck, D. E. 1965. A list of some bee flies of the Nevada test site. Gr. Basin Nat. 25(1-2): 5-11. Reports on 111 species in 24 genera. Four former subspecies are given specific status. Plant community association and dates of occurrence are given for all species.

Cockerell, T. D. A. 1895. Phthiria sulphurea Loew. Psyche 7: 188-189. Redescribes the species.

Cole, F. R. 1917. Notes on Osten Sacken's group "Poecilanthrax", with descriptions of new species. Jour. New York Ent. Soc. 25: 67-80. Discusses 15 species, 5 new species, as Anthrax.

- 1923. Notes on California Bombyliidae with descriptions of new species. Jour. Ent. Zool., Pomona College 15(2) 21-26. Described 4 species new to science.

Coquillett, D. W. 1886a. Monograph of the Lomatina of North America. Canad. Ent. 18: 81-87. Gives keys and descriptions to species in four genera.

- 1886b. The North American species of Toxophora. Ent. Amer. 1: 221-222. Gives key to the species, diagnosis of the described species and describes two as new.

- 1887a. Monograph of the species belonging to the genus Anthrax from America north of Mexico. Trans. Amer. Ent. Soc. 14: 159-182. Provides keys and descriptions for all known species.

- 1887b. Synopsis of the North American species of Lordotus. Ent. Amer. 3: 115-116. Gives a key to the species, describes 3 species as new.

- 1891a. New Bombyliidae from California. West. Amer. Sci. 7: 197-200. Species in Lordotus and Toxophora are keyed with descriptions of 3 new species.

- 1891b. New Bombyliidae of the group Paracosmus. West. Amer. Sci. 7: 219-222. Describes Amphicosmus and Metacosmus as new genera and provides descriptions for 3 new species.

- 1891c. Revision of the bombylid genus Aphoebantus. West. Amer. Sci. 7: 254-264. Provides keys to species and descriptions of all known species.

- 1892a. Revision of the bombylid genus Epacmus (Leptochilus). Can. Ent. 24: 9-11. Gives key to the included species and described 3 species as new.

- 1892b. Notes and descriptions of Bombyliidae. Can. Ent. 24: 123-126. Provides a key to the species of Exoprosopa with descriptions of 2 new species; describes 2 new species of Geron.

- 1892c. Revision of the species of Anthrax from America north os Mexico. Trans. Amer. Ent. Soc. 19: 168-187. Essentially as the 1887a paper but enlarged to include Osten Sacken's species as well as new ones.

- 1894. Notes and descriptions of North American Bombyliidae. Trans. Amer. Ent. Soc. 21: 89-112. Provides a key to the genera then discusses most of the genera with keys to species and descriptions of new species.

- 1904. New North American Diptera. Proc. Ent. Soc. Wash. 6: 166-192. Describes 12 new species of Phthiria on pages 172-177.

Cresson, E. T. 1915a. A new genus and some new species belonging to the dipterous family Bombyliidae. Ent. News. 26: 200-207. Describes Pseudogeron as new and includes 13 species describing 8 as new to science.

- 1915b. Note on the bombyliid genus Rhabdopselaphus Rondani (Pseudogeron Cress.) (Dip.) Ent. News 26: 305. Places Pseudogeron in synonymy with Rhabdopselaphus.

- 1915c. Some North American Diptera from the southwest. Paper III. A revision of the species of the genus Mythicomyia. Ent. News 26: 448-456.

- 1916. Dipterological notes. II. A study of the lateralis-groups of the bombyliid genus Villa (Anthrax of authors, in part). Ent. News 27: 439-444. Discusses the problems within the lateralis-group and redescribes lateralis and alternata and describes new species.

- 1923. Records of some western Diptera, with descriptions of two new species of the family Bombyliidae. Proc. Acad. Nat. Sci. Philadelphia. 75: 365-367. Describes two new species of Lordotus.

Evenhuis, N. L. 1975. A new species of Bombylius (Diptera: Bombyliidae) from the Mojave Desert of California. Jour. Kansas Ent. Soc. 48(4): 472-476. Describes and illustrates Bombylius mohavensis.

- 1977. New North American Bombyliidae (Diptera) with notes on some described species. Ent. News 88(546): 121-216. Describes 5 new species and 1 new subspecies.

- 1978. New species and new subgenus of Bombylius (Diptera: Bombyliidae). Ent. News 89(1 & 2): 33-38. Describes new subgenus, Zephyrectes and 2 new species and 2 new subspecies of Bombylius.

Greene, C. T. 1924. New species of Mythicomyia and its relationship, with a new genus (Diptera). Proc. Ent. Soc. Wash. 26(3): 60-64. Des-

cribes 2 new species of Mythicomyia and the genus Pachyneres with one included species.

Hall, J. C. 1952. A new species of Lordotus from southern California. (Bombyliidae: Diptera). Pan-Pac. Entom. 28(1): 49-50. describes Lordotus ermae as new.

- 1954. A revision of the genus Lordotus Loew in North America (Diptera: Bombyliidae). Univ. Calif. Publ. Ent. 10(1): 1-33. Gives key and redescribes all species, also gives distributions.

- 1956. A new species of Anastoechus Osten Sacken with notes on the congeners. Ent. News 67: 199-203. Gives key to species and describes 1 as new.

- 1957. Notes and descriptions of new California Bombyliidae (Diptera). Pan-Pac. Entom. 33(3): 141-148. Separates Amphicosmus, Paracosmus and Metacosmus and gives a key to the species of Amphicosmus, also describes 3 new species in other genera.

- 1958. A change of name in the bombyliid genus Anastoechus (Diptera). Ent. News 69: 195. Changes deserticola to hessei.

- 1969. A review of the subfamily Cylleniinae with a world revision of the genus Therenemyia Bigot (Eclimus auct.) (Diptera: Bombyliidae). Univ. Calif. Publ. Ent. 56: 1-85. Discusses relationships within the Cylleniinae, erects the subfamily Ecliminae and revises the genus Thevenemyia.

- 1970. The North American species of Villa (Thyridanthrax) (Osten Sacken) Diptera: Bombyliidae . Trans. Amer. Ent. Soc. 96: 519-542. Revises the subgenus Thyridanthrax, gives keys to the species and redescribes all species.

- 1972. New North American Heterotropinae (Diptera; Bombyliidae). Pan-

Pac. Entom. 48(1): 37-50. Gives keys to Heterotropine genera, species of Prorates and Caenotoides. Describes Caenotoides as a new genus, also describes 8 new species.

- 1975a. The North American species of Triploechus Edwards (Diptera: Bombyliidae). Pan-Pac. Entom. 51(1): 49-56. Revises the genus, gives a key to the species and describes 2 as new.

- 1975b. New Southwestern Bombyliidae (Diptera). Ent. News 86(5 &6): 107-113. Describes 4 new species, 1 new genus and 1 new subgenus.

- 1976. A revision of the North and Central American species of Lepidanthrax Osten Sacken (Diptera: Bombyliidae). Trans. Amer. Ent. Soc. 102: 289-371. Completely revises the genus, gives keys to species and redescribes all species.

Hull, F. M. 1973. Bee flies of the World. The genera of the family Bombyliidae. Smithsn. Inst. Press, Washington, pp. 1-687. Proposes a new classification of the family. Redescribes all the world genera, gives lists of species and representative drawings of the genera.

Hull, F. M. and Martin, W. C. 1974. The genus Neodiplocampta Curran and related bee flies (Diptera: Bombyliidae). Proc. Ent. Soc. Wash. 76(3): 322-246. Redescribes the genus, gives a key to the species, and redescribes or diagnosis all known species, describes 8 new species.

Johnson, D. E. and Johnson, L. M. 1957. New Poecilanthrax, with notes on described species (Diptera: Bombyliidae). Great Basin Nat. 17: 1-26. Gives a key to the species, describes 7 new species and 2 new subspecies.

- 1958. New and insufficiently known Exoprosopa from the far west (Diptera: Bombyliidae). Great Basin Nat. 18: 69-84. Describes 5 new species most from Utah.

- 1959. Notes on the genus Lordotus Loew, with descriptions of new species (Diptera: Bombyliidae) Great Basin Nat. 19: 9-26. Discusses specific relationships within the genus and describes 6 species and 4 subspecies new to science.

- 1960. (1959). Taxonomic notes on North American bees flies, with descriptions of new species (Diptera: Bombyliidae). Great Basin Nat. 19: 67-74. Describes 2 new species and one new name, the latter in Exoprosopa.

Marston, N. 1963. A revision of the Nearctic species of the albofasciatus group of the genus Anthrax Scopoli (Diptera: Bombyliidae). Agric. Exp. Sta., Kansas St. Univ. Tech. Bull. 127: 1-79. Treats 17 species in the group with descriptions of 8 new species and subspecies; keys to species and distribution maps are given.

- 1970. Revision of new world species of Anthrax (Diptera: Bombyliidae), other than the Anthrax albofasciatus group. Smithsn. Contr. Zool. No. 43, pp. 1-148. Treats all species of Anthrax in the western hemisphere, gives keys to species and distribution maps.

Melander, A. L. 1946. Apolysis, Oligodranes, and Empididеicus in America (Diptera: Bombyliidae). Ann. Ent. Soc. Amer. 39(3): 451-495. Gives keys to genera and species; describes 48 new species.

- 1950a. Aphoebantus and its relatives Epacmus and Eucessia (Diptera: Bombyliidae). Ann. Ent. Soc. Amer. 43(1): 1-45. Discusses relationships of the three genera, provides keys to the species and describes 29 new species.

- 1950b. Taxonomic notes on some smaller Bombyliidae (Diptera). Pan-Pac. Ent. 27(3 & 4): 139-144. Discusses relationships between four genera and gives descriptions of new species in other genera with keys to species.

- 1961. (1960). The genus Mythicomyia (Diptera: Bombyliidae). Wasmann Jour. Biol. 18(2): 161-261. Revises the genus, gives key to species and provides descriptions for 146 species, 135 of which are new.

Osten Sacken, C. R. 1886-1887. In: Biologia Centrali-Americana. Insecta Diptera, London, vol. 1, 216 pp. Describes numerous species mostly from Mexico. This is the basis for many contemporary genera.

Painter, R. H. 1930. A review of the bombyliid genus Heterostylum (Diptera). Jour. Kansas Ent. Soc. 3(1): 1-7. Gives key to the species, diagnosis of described forms and describes 3 new to science.

- 1932. A monographic study of the genus Geron Meigen as it occurs in the United States (Diptera: Bombyliidae). Trans. Amer. Ent. Soc. 58: 139-167. Gives keys and descriptions for all species. describes 12 new species.

- 1940. (1939). Notes on type specimens and descriptions of new North American Bombyliidae, Trans. Kansas Acad. Sci. 42: 267-301. Treats nine genera with keys to species and short descriptions of each species.

Painter, R. H. and Hall, J. C. 1960. A monograph of the genus Poecilanthrax (Diptera: Bombyliidae). Tech. Bull. No. 106. Agric. Exper. Sta. Kansas St. Univ., pp. 1-132. Gives complete treatment of the genus with keys and descriptions of all known species.

Painter, R. H. and Painter, E. M. 1962. Notes on the redescriptions of types of North American Bombyliidae (Diptera) in European museums. Jour. Kansas Ent. Soc. 35(1): 1-164. Gives location, condition and redescription of the types found in Europe.

Priddy, R. B. 1939a. Preliminary report on the Bombyliidae of southern California. Jour. Ent. Zool., Pomona Coll., Calif. 31(3): 1-2. Lists several species collected in southern California.

- 1939b. List of Bombyliidae collected in southern California and Yuma County, Arizona. Jour. Ent. Zool., Pomona Coll., Calif. 31(3): 45-53. Gives a list of species personally collected.

- 1958. The genus Conophorus in North America (Diptera: Bombyliidae). Jour. Kansas Ent. Soc. 31(1): 1-33. Revises the genus, provides key to species, redescriptions of all described species and describes 3 species as new.

Williston, S. W. 1893. In Riley: Diptera of the Death Valley expedition. U.S. Dept. Agric., North American Fauna, 7: 253-259. Describes 4 new species.

- 1900 - 1901. In: Biologia Centrali-Americana. Insecta, Diptera, London, vol. 1 supplement, pp. 217-378. Adds additional species, descriptive notes and distribution to species described by Osten Sack

* There are many additional papers but all are of little consequence with reference to the study area.

Bureau of Land Management
Library
Bldg. 50, Denver Federal Center
Denver, CO 80225

Bureau of Land Management
Library
Bldg. 50, Denver Federal Center
Denver, CO 80225

Borrower's

QL
537
/B65
H17

Review of literatu
of the Bombyliid
outline of the d
potentially enda

Date Loaned	Borrower